

1 Abstract

2 The invention provides systems, methods and apparatus for processing delicate parts
3 within a process tank such as an ultrasonic tank. Typically, one or more transducers connect
4 to the tank and respond to drive signals from a generator to produce ultrasound within process
5 liquid within the tank. Specific features of the invention include: (1) a power up-sweep
6 ultrasonic system for moving contaminants upwards within the tank by sweeping transducer
7 drive signals from an upper frequency to a lower frequency without sweeping from the lower
8 frequency to the upper frequency; (2) a multi-generator system for producing ultrasound at
9 selected different frequencies within the tank by switching a common transducer bank to one
10 of the generators in response to remote relays initiated by the user; (3) a probe sensing
11 system for sensing process conditions within the tank including an enclosure for housing a
12 sample liquid and one or more sensing transducers within the sample liquid, the transducers
13 generating signals indicative of characteristics of the sample liquid, a subsystem analyzing
14 the signals in feedback with the generator to modify process conditions; (4) variable voltage
15 ultrasonic generator systems to accommodate varying world-wide voltage supplies; (5) a
16 laminar process tank for efficiently pushing contaminants upwards in a tank; (6) a quick
17 dump rinse tank including a pressure cavity to accelerate dumping processes; (7) an ultrasonic
18 generating unit formed of a printed circuit board (PCB) and multiple transducers within the
19 PCB; (8) an AC power system to produce an AC voltage at frequency f that is impressed
20 across a capacitive element; and (9) various configurations of transducers, including acid-safe
21 transducers, double-compression transducers, and transducers with increased reliability.

22